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ONTARIO WATER
RESOURCES COMMISSION

ANNUAL REPORT 1964

TRENTON

water pollution control plant

DIVISION OF PLANT OPERATIONS
Ontario Water Resources Commission

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ONTARIO WATER RESOURCES COMMISSION

OFFICE OF THE GENERAL MANAGER

Members of the Trenton Local Advisory Committee,
Town of Trenton.

Gentlemen:

We are pleased to provide you with the 1964 Operating Report for the Trenton Water Pollution Control Plant, OWRC Project No. 57-S-4.

By continuing the mutual cooperation which has existed in the past, we can look forward to greater progress in the field of water pollution control.

Yours very truly,

D. S. Caverly,
General Manager

General Manager,
Ontario Water Resources Commission.

Dear Sir:

It is with pleasure that I present to you the Annual Report of the operation of the Trenton Water Pollution Control Plant, OWRC Project No. 57-S-4 for 1964.

This report presents design data, outlines operating problems encountered and summarizes in tables, charts and graphs all significant flow and cost data.

Yours very truly,

B. C. Palmer, P. Eng.,
Director,
Division of Plant Operations.

FOREWORD

This report describes the operation of this project for the year 1964. It includes a detailed description of the project, summary of operation, graphs and charts showing quality and quantity information, and project cost data.

This information will be of value to the municipality in assessing the adequacy of the works in meeting existing requirements and in projecting its capability to meet future expected demands. The cost information will be of particular interest to those concerned with developing and maintaining revenue structures.

The preparation of this report has been a cooperative effort of several groups within the Division of Plant Operations. These include the Statistical Section, Brochures Officer and the Regional Supervisor. However, the primary responsibility for the content has been with the Regional Operations Engineer. He will be pleased to discuss all aspects of this report with the municipality.

B. C. Palmer, P. Eng.,
Director,
Division of Plant Operations.

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TRENTON

water pollution control plant

operated for

THE TOWN OF TRENTON

by the

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Regional Supervisor: D. A. McTavish
Operations Engineer: J. N. Dick

801 Bay Street Toronto 5

'64 REVIEW

The object of this report is to present in detail all significant data on the operation of the Trenton Water Pollution Control Plant during 1964. Included are figures on costs, flows, strengths of raw and treated sewage, as well as comments on and explanations of the treatment process.

The total 1964 operating cost was $18,422.16. This is a significant increase over the 1963 operating cost of $12,104.42. Two main cost items involved in the increased operating costs were (1) Lundy Fence Company $506.00 for the raising of the plant site fence. (2) Town of Trenton $718.00 for curbs and driveway work at the pumping station. Both of these items entailed work performed in 1963 but costs charged to the 1964 operating budget.

In May of 1961 the Division of Sanitary Engineering requested year-round chlorination. This increased the cost of chlorine and water in 1964 by $1588.00.

In 1964 a part-time operator was also employed to work half days at the Trenton plant. The cost for additional help was approximately $2000.00.

Cost per million gallons treated increased from $31.52 to $99.98 from 1963 to 1964. However these figures cannot be considered too reliable as the flowmeter was out of order for some time giving consistently low measurements. This is also reflected in the cost per pound of BOD removed which was 5 cents in 1963 and 12 1/2 cents in 1964.

Generally, there is a decreasing trend in plant flows in spite of the error of the flowmeter. This is due to an improved program of sewer maintenance and storm water control initiated by the Town of Trenton. A more efficient degree of treatment can be attained at the plant and flooding risks at the Dundas Street Pumping Station are reduced during periods of high surface runoff.

During 1964, 163,650 cubic feet of raw sludge was pumped to the digesters and 14,730 cubic feet of digested sludge was removed. An average of 76.5% reduction in volatile matter indicates a very good digestion process.

Year round chlorination of the plant effluent recommended as of May 16 1964. A total of 10,628 pounds of chlorine was used at a net cost of $2352.20.

The plant staff has operated and maintained the plant and pumping station in a satisfactory manner. The efficiency of the process was quite acceptable averaging 42.5% BOD and 57.0% suspended solids removal throughout 1964.

GLOSSARY

BOD	biochemical oxygen demand (a measure of organic content)
cfm	cubic feet per minute
comminution	shredding of solids into small fragments
DWF	dry weather flow
effluent	outflow
flocculation	bringing very small particles together to form a larger mass (the floc) before settling
fps	feet per second
gpcd	gallons per capita per day
gpm	gallons per minute
grit	sand, dust, stones, cinders and other heavy inorganic material
influent	inflow
lin. ft.	lineal feet
mgd	million gallons per day
mlss	mixed liquor suspended solids
ppm	parts per million
ss	suspended solids
TDH	total dynamic head (usually refers to pressure on a pump when it is in operation)

HISTORY
1956 – 1964

INCEPTION

In 1956, the Town of Trenton and the Ontario Water Resources Commission initiated plans for the construction of a modern sewage treatment plant.

The firm of Gore & Storrie Limited, Toronto, Ontario, Consulting Engineers was engaged to prepare plans and specifications for the project.

APPROVAL

In 1957, the town signed an agreement with the Ontario Water Resources Commission to finance, construct and operate the plant.

CONSTRUCTION

The construction of the project began in the spring of 1959. The plant was constructed by Bradford-Hoshal Associates Limited of Port Hope, Ontario and the Dundas Street pumping station was constructed by Bedford Construction Company of Toronto. By January 1960, the project was completed and the Division of Plant Operations began the operation of the project.

TOTAL COST

$515,665



J. STEWART
CHIEF OPERATOR

Project Staff

E. McLean,
Operator

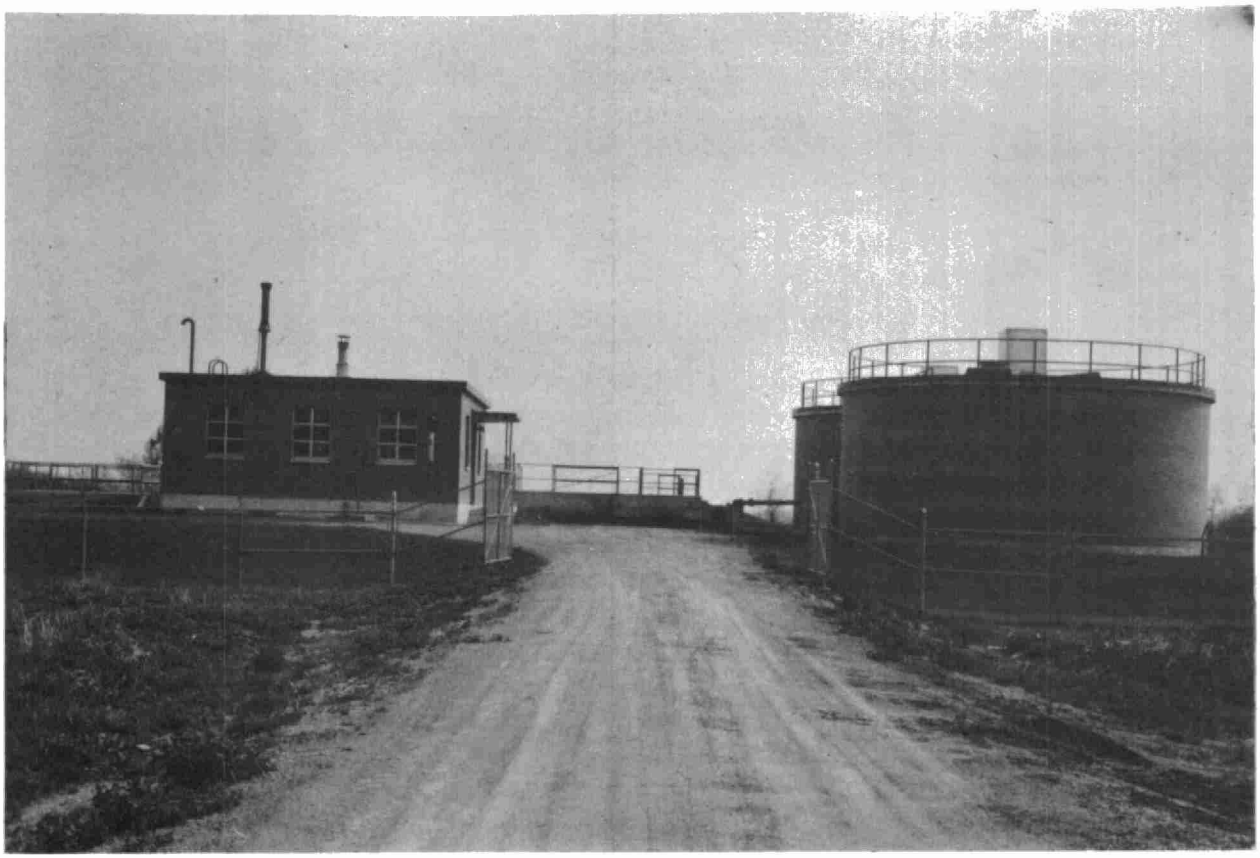
COMMENTS

On October 31. 1961, Mr. James Stewart was employed as the Operator of the Trenton Water Pollution Control Plant.

Mr. Stewart has completed the three operators' courses which are available to operators through the Ontario Water Resources Commission. Mr. Stewart, therefore, has his certification as a water pollution control plant operator.

Mr. Earl McLean was hired on staff in June 1964. One-half of his working hours is spent at the Trenton plant and the other half is spent at the Village of Batawa treatment plant. His salary is charged accordingly to each project.

The operators should be complimented for their enthusiasm and interest in the operation of the plant.



Description of Project

GENERAL

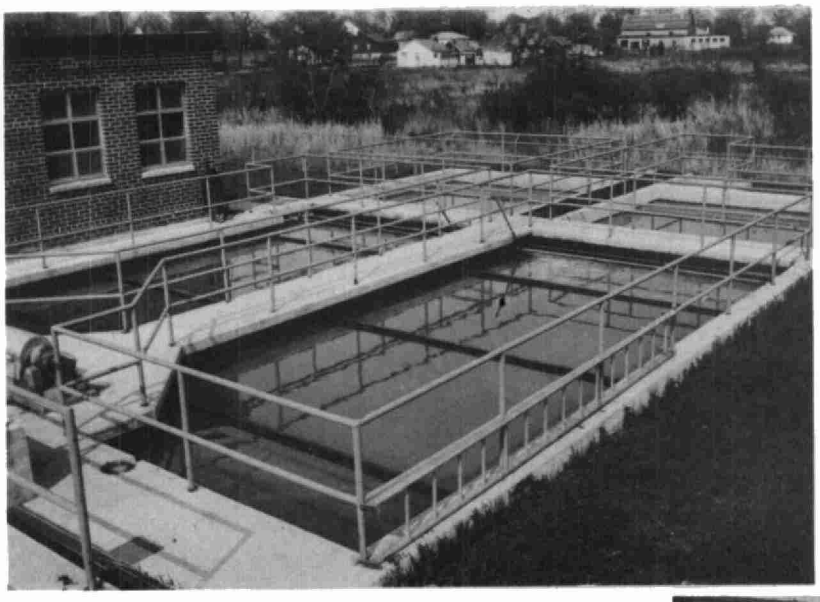
The waste from the west side of the Trent River is conveyed under the river via a 24 inch concrete gravity sewer to the Dundas Street pumping station. Similarly, the waste from the east side of the Trent River is conveyed to the pumping station wet well via a 24 inch concrete sewer entering the north wall of the building.

From the Dundas Street pumping station, the waste is transported to the treatment plant by a 16 inch force main.

INFLUENT WORKS

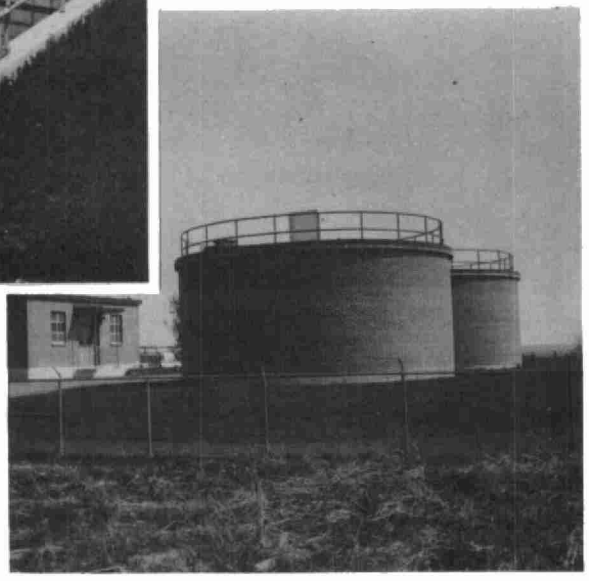
Before the sewage enters the influent works, it passes through a Builders-Providence, Inc. venturi meter, where all flow to the plant is measured. The sewage next enters the inlet chamber of the influent works and is there directed through a 24 inch sluice gate to the aerated grit chamber.

Compressed air is forced into the grit chamber in such a manner as to impart a roll to the tank contents. The velocity of the roll is controlled so that the organic material stays in suspension and passes through the grit chamber. The grit material is lifted by a four inch air pump into a decanting trough where the



LEFT: PRIMARY SEDIMENTATION TANKS

BELOW: DIGESTERS



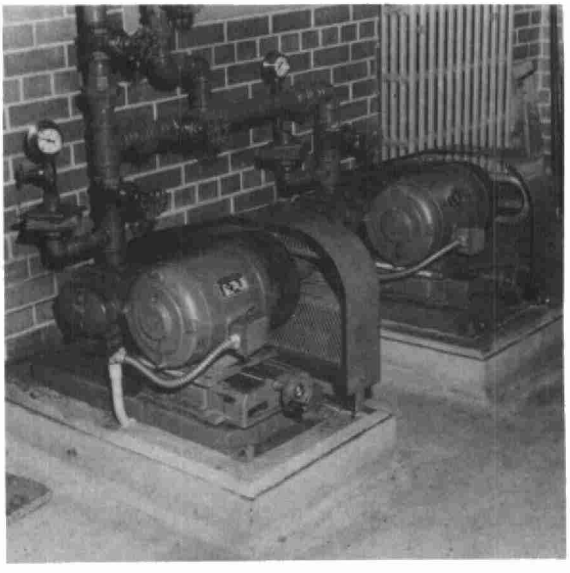
liquid and solid phases are separated. The washed grit is normally removed from the decanting trough and disposed of as sanitary land fill.

PRIMARY SEDIMENTATION TANKS

Two rectangular primary sedimentation tanks, 52 feet in length, receive the sewage from the grit removal unit. It is retained in the sedimentation tanks for approximately three hours at design flow. Approximately 50 percent of the suspended solids in the incoming sewage settles to the bottom of the sedimentation tanks. Each sedimentation tank is equippped with a sludge scraper which moves the settled sludge to a hopper located at the front end of the tank. The sludge is then pumped automatically at a pre-set interval to the digestion tank.

SLUDGE DIGESTION TANKS

The Trenton plant utilizes two stage digestion. There are two digesters, one secondary tank of 28 feet in diameter. The piping to the digesters is so arranged that raw sludge can be pumped to either tank and digested sludge can also be removed from either tank.



AIR BLOWERS

Both digesters have fixed covers. The primary digester contents are mixed with compressed digester gas and also circulated through a Pacific flush tank heat exchanger.

PROJECT COSTS

LONG TERM DEBT: (Total Capital Cost)	$515,665.00

The total cost to the municipality during 1964 was as follows:

Net Operating	$ 18,422.16
Debt Retirement	10,406.00
Reserve	3,556.00
Interest Charged	29,011.46
TOTAL	$ 61,395.62

RESERVE ACCOUNT

Balance at January 1, 1964	$ 17,111.39
Deposited by municipality	3,556.00
Interest Earned	1,019.77
	$ 21,687.16
Less Expenditures	-
Balance at December 31, 1964	$ 21,687.16

DEBT OUTSTANDING:	$466,514.30

YEARLY COSTS

MONTH	TOTAL EXPENDITURE	PAYROLL	CASUAL PAYROLL	FUEL	POWER	CHEMICAL	GENERAL SUPPLIES	EQUIPMENT	REPAIRS & MAINTENANCE	SUNDRY	WATER
JAN	538.26	410.55		71.97			29.27			26.47	
FEB	2148.73	428.01		79.17	213.57		66.32		1285.06	33.52	43.08
MARCH	1688.26	479.78			209.96		56.59		269.28	636.21	36.44
APRIL	952.57	460.96		150.59	195.80		76.94			45.08	23.20
MAY	1254.78	701.75		69.44	223.22		26.02	90.64	38.24	51.14	54.33
JUNE	2139.19	537.69	30.39	60.39	210.80	1148.05	79.80			55.47	16.60
JULY	1343.05	293.46	115.50	32.78	211.34	(280.00)	51.21		761.41	42.54	114.81
AUG	2618.02	431.26	121.56		197.45	1148.05	2.85	14.36	528.66	46.92	126.91
SEPT	732.76	305.12	91.17		188.02	(280.00)	35.24		66.25	213.40	113.56
OCT	2531.19	327.38	169.95		206.37	868.05	88.68		720.44	21.27	129.05
NOV	1020.62	266.96	122.31		195.46	(280.00)	25.35			575.60	114.94
DEC	1454.73	440.19			361.88	28.05	167.18		92.52	59.29	305.62
TOTAL	18422.16	5083.11	650.88	464.34	2413.87	2352.20	705.45	105.00	3761.86	1746.10	1139.29

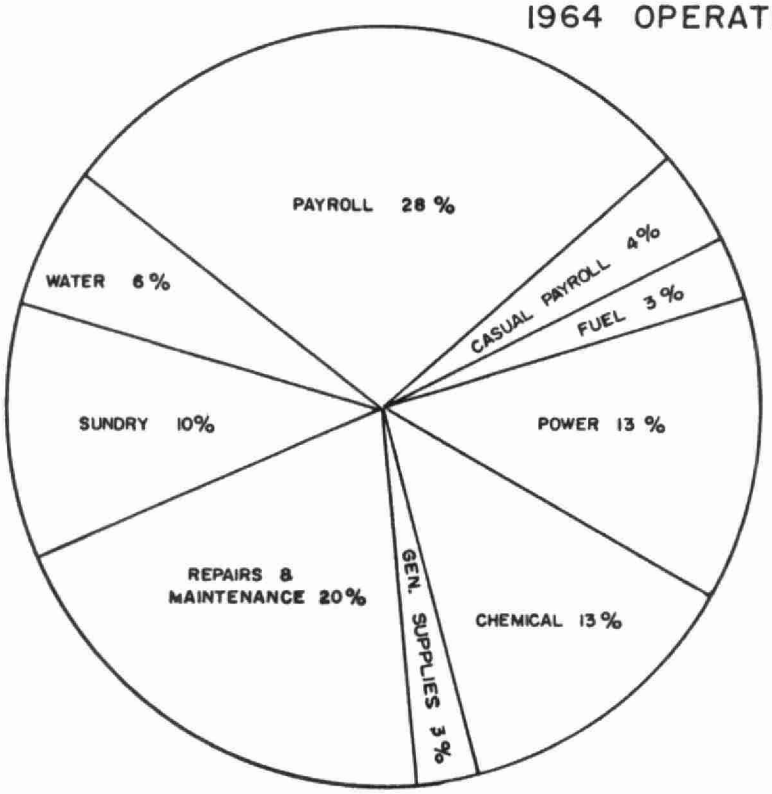
BRACKETS INDICATE CREDIT

MONTHLY COSTS

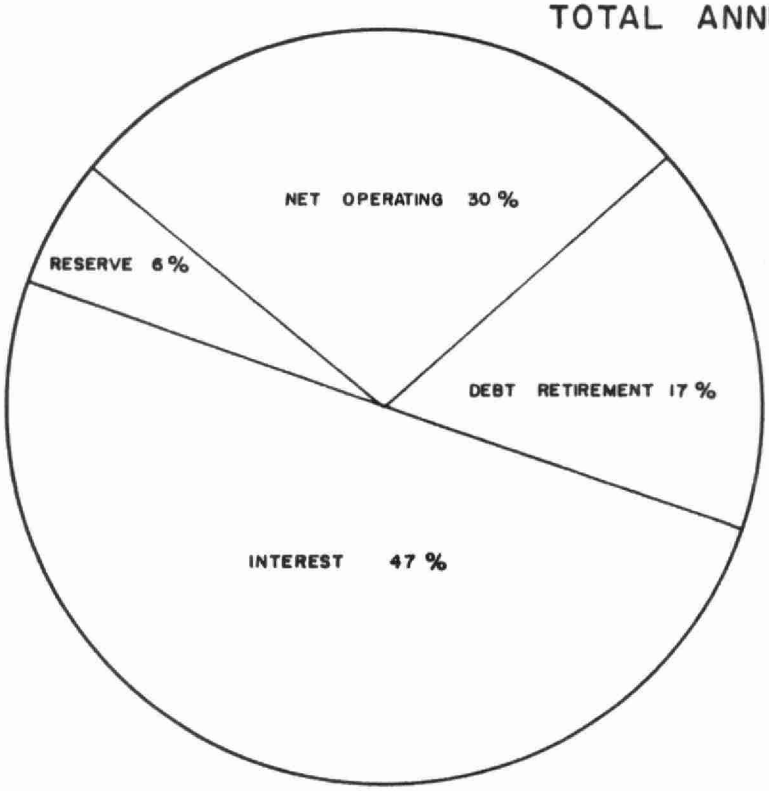
YEAR	M.G. TREATED	TOTAL COST	COST PER FAMILY PER YEAR	COST PER MILLION GALLONS	COST PER L.B. OF BOD REMOVED
1962	496	12,577.44	* 3.70	25.35	2 1/2 CENTS
1963	384	12,104.42	3.59	31.52	5 CENTS
1964	184.25	18,422.16	5.19	99.98	12 1/2 CENTS

* BASED ON ANNUAL POPULATION ESTIMATE AND 3.9 PERSONS PER FAMILY

1964 OPERATING COSTS

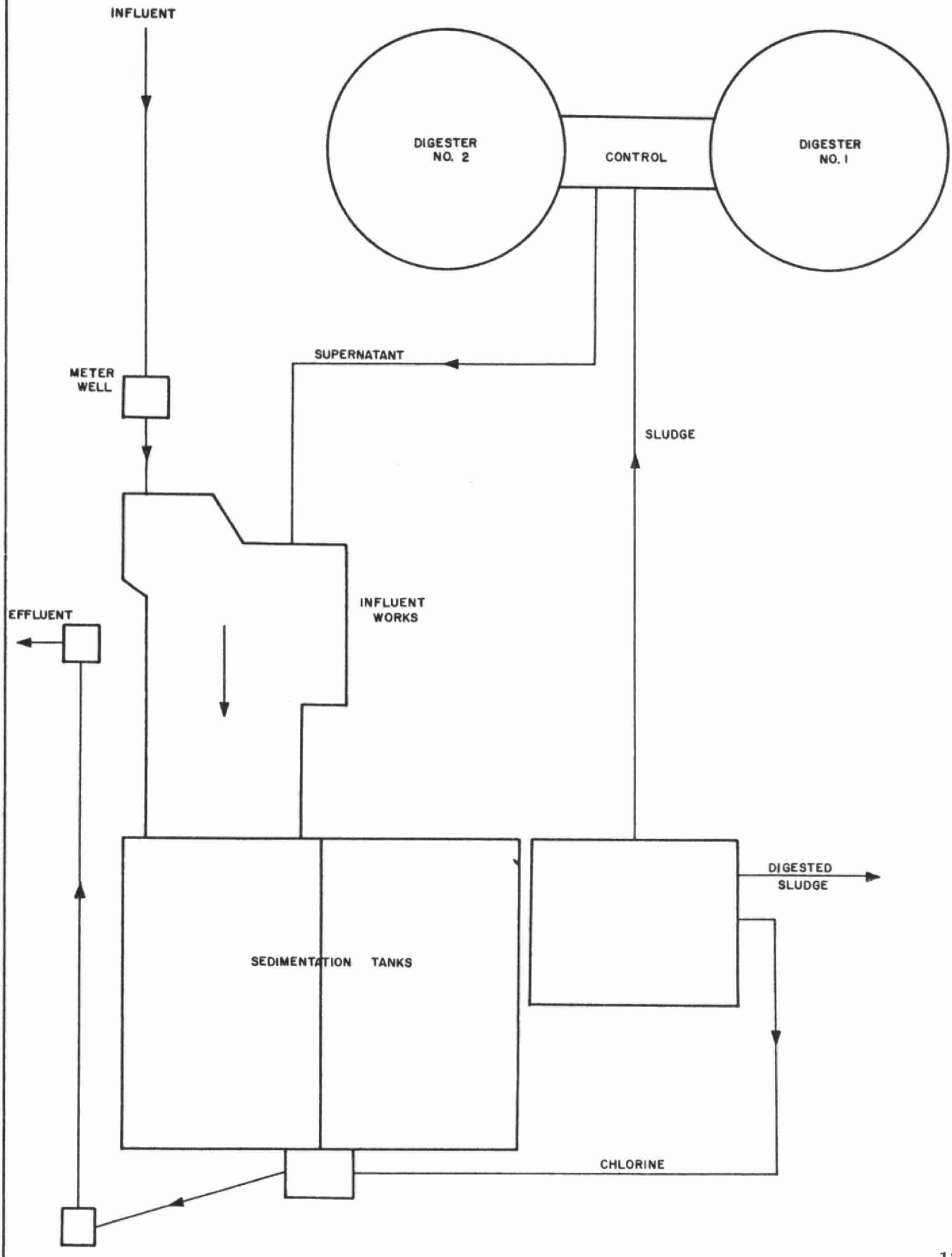


TOTAL ANNUAL COST



Technical Section

GENERAL LAYOUT OF TRENTON PLANT



Design–Data

GENERAL

Type of Plant - Primary treatment with provision for the extension to complete treatment.

Design Population - 12,000 persons. 15,000 persons when extended to complete treatment.

Design Plant Flow - 83.3 gallons per capita per day or 1.0 million gallons per day.

Five Day BOD -

Raw Sewage	-	250 PPM
Removal	-	35%

Suspended Solids -

Raw Sewage	-	200 PPM
Removal	-	55%

PRIMARY TREATMENT

Grit Removal

Aerated grit chamber with four inch air pump to remove grit from hopper into decanting trough.
One unit - 10' x 9' x 8'6"
Volume - 765 cu. ft. or 4775 Imperial gallons.

Screening

Bar screen on by-pass channel.

Primary Sedimentation Tanks

Two rectangular units - size 52' x 16' x 12'.

Volume - 20,000 cu. ft. or 125,000 gallons (total).

Retention at Design - 3.0 hours.

Surface Settling Rate - 600 gallons per square foot per day.

Weir Overflow Rate - 8340 gallons per lineal foot of weir per day.

Sludge Collectors - Jeffery Manufacturing Company Limited.

Longitudinal Sludge Collectors - Manually operated scum trough.

OUTFALL WORKS

850 feet of 30 inch concrete pipe.

The outfall sewer also acts as a chlorine contact chamber.

DIGESTION SYSTEM

Two cylindrical units - 28 feet in diameter and 23 feet high.

Volume - 27,000 cubic feet.

Digester Loading - 2.25 cubic feet per capita.

1.31 pounds of solids per cubic foot per month.

Primary digester contents agitated by gas recirculation.

DUNDAS STREET PUMPING STATION

Unit No. 1 - 15 HP Westinghouse motor.

Fairbanks Morse pump - 700 IGPM @ 39 TDH.

Unit No. 2 - 40 HP Westinghouse motor.

Fairbanks-Morse pump - capacity 1740 IGPM @ 48 TDH.

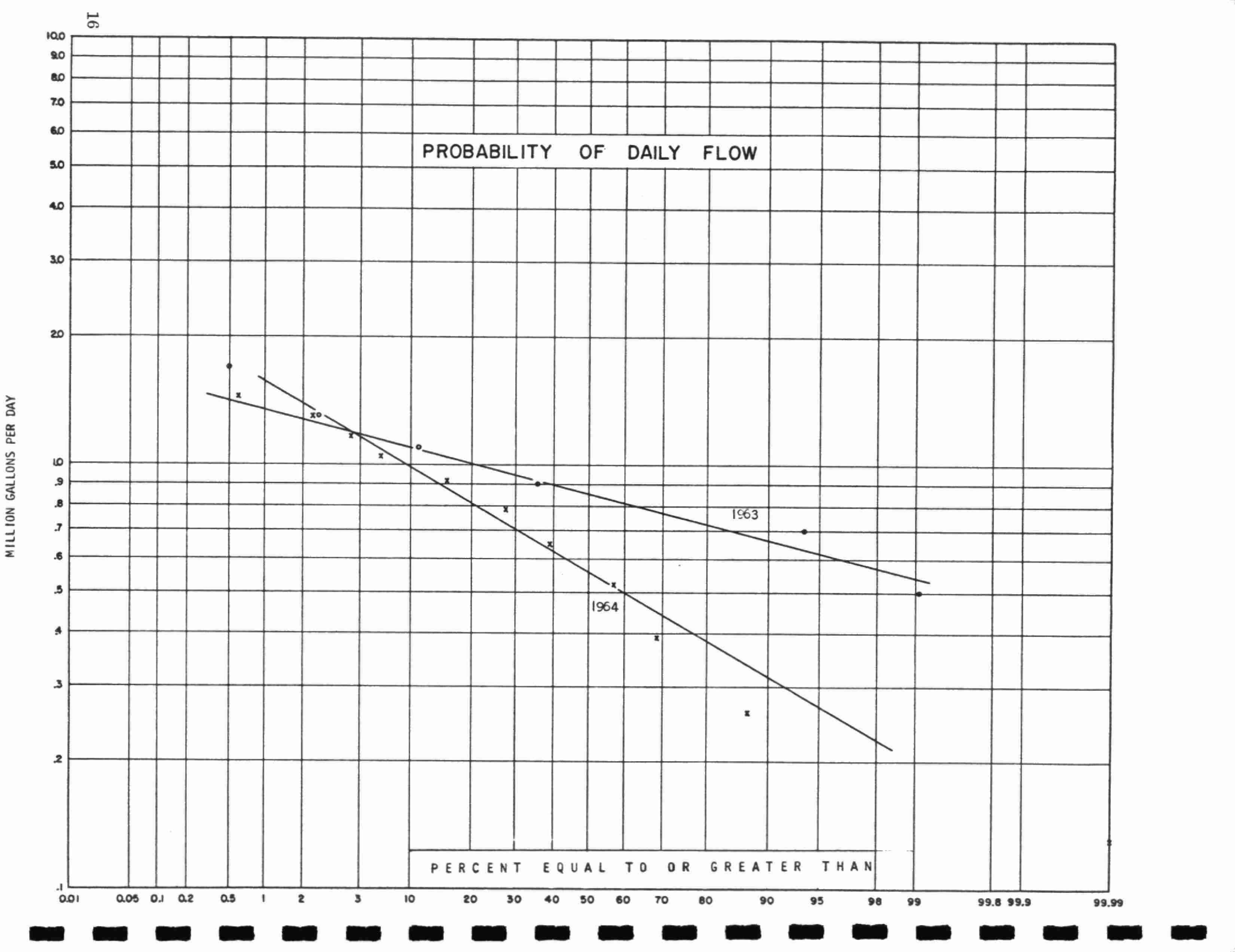
Unit No. 3 - Cummins diesel motor BHP 85 @ 1800 RPM.

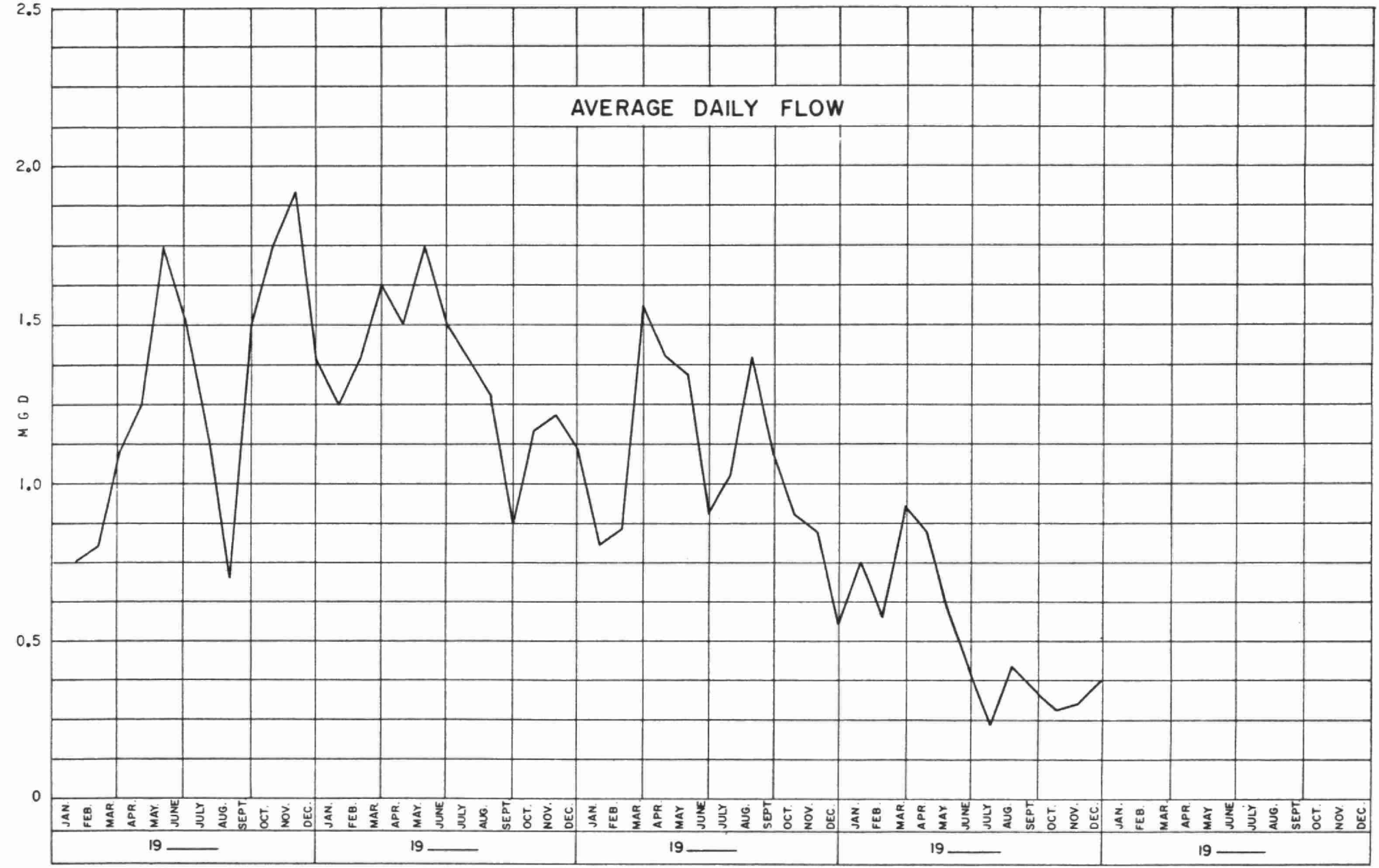
Fairbanks-Morse pump - capacity 3130 IGPM @ 687 TDH.

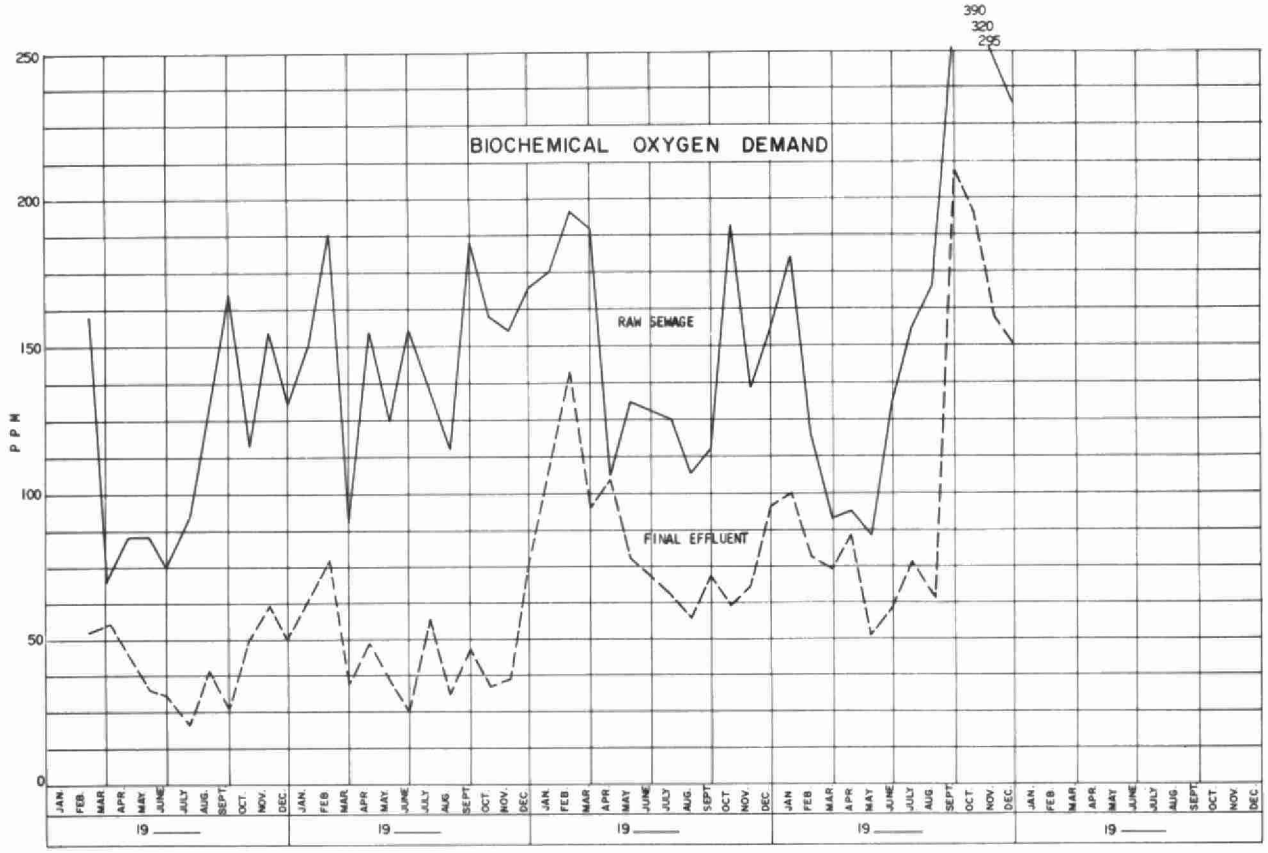
Process Data

From the probability curves, it can be seen that considerably less flow was received at the plant during 1964 than during the previous year. In 1964, flows exceeded the 1.0 mgd design capacity of the plant 9% of the time while in 1963, 1.0 mgd was exceeded 20% of the time.

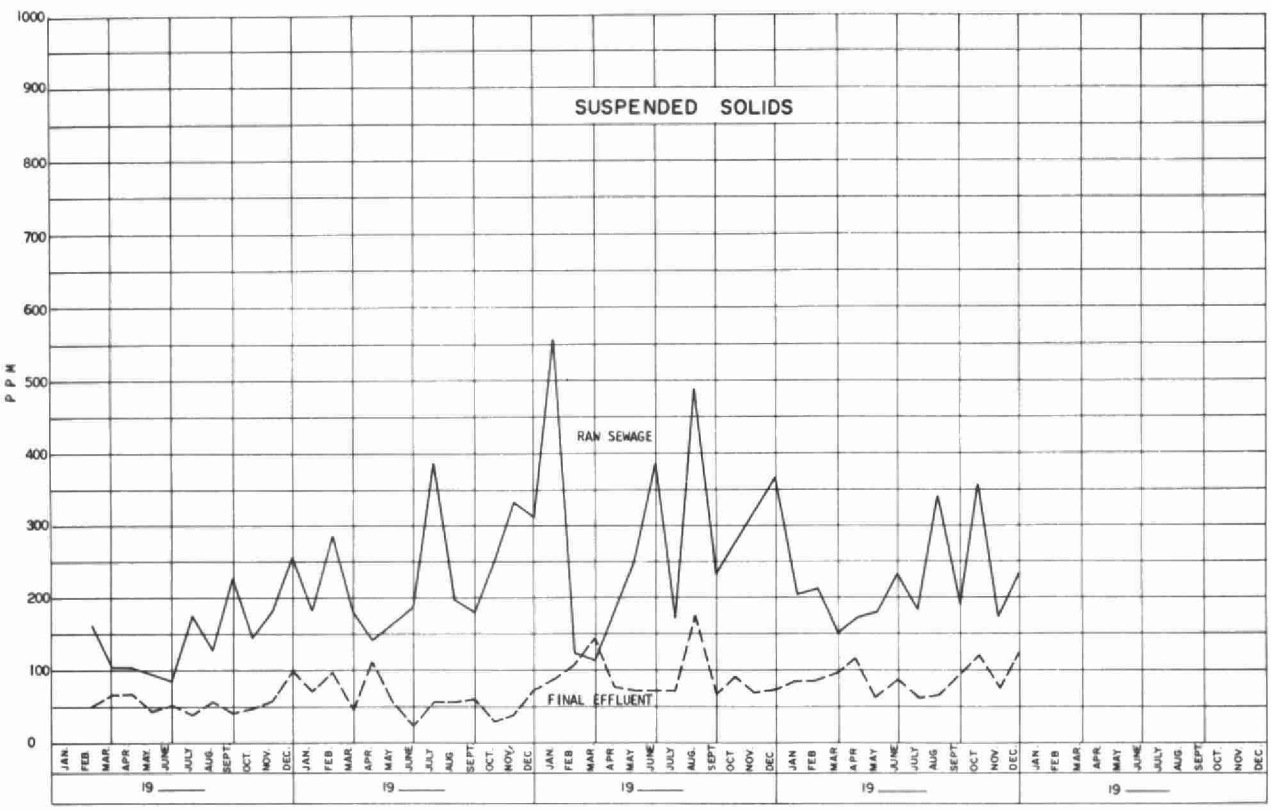
The average daily flow plot for 1961 through 1964 shows a definite trend towards lower flows. This is a desirable situation and is due to the Town's program of separating storm water from the sanitary sewers. However, it should be noted that the venturi flowmeter at the plant was out of order during part of 1964 and if anything, the flow figures during this period were low.


PROBABILITY OF DAILY FLOW
MILLION GALLONS PER DAY
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
.9
.8
.7
.6
.5
.4
.3
.2
.1
1963
1964
PERCENT EQUAL TO OR GREATER THAN
0.01
0.05
0.1
0.2
0.5
1
2
3
10
20
30
40
50
60
70
80
90
95
98
99
99.8
99.9
99.99


AVERAGE DAILY FLOW
2.5
2.0
1.5
1.0
0.5
0
M G D
JAN. FEB. MAR. APR. MAY. JUNE JULY AUG. SEPT OCT. NOV. DEC.
19 ____



MONTHLY VARIATIONS



GRIT, B.O.D AND S.S. REMOVAL

MONTH	B. O. D.				S. S.				GRIT REMOVAL CU. FT.
	INFLUENT P.P.M.	EFFLUENT P.P.M.	% REDUCTION	TONS REMOVED	INFLUENT P.P.M.	EFFLUENT P.P.M.	% REDUCTION	TONS REMOVED	
JAN.	180	100	44.5	9.2	205	88	57	13.5	129
FEB.	120	78	35	3.6	212	88	58.5	10.5	53
MAR.	92	74	19.5	2.6	152	96	37	8.1	34
APR.	94	86	8.5	1.0	172	118	31.5	6.9	66
MAY	86	51	40.5	3.3	180	64.5	64.5	13.5	73
JUNE	130	60	54	4.2	234	88	62.5	8.7	28
JULY	155	76	51.0	2.8	184	64	65.0	4.3	80
AUG.	170	64	62.5	6.8	338	68	80.0	17.4	92
SEPT.	390	210	46.0	9.0	198	92	53.5	5.3	39
OCT.	320	195	39.0	5.4	358	122	66.0	10.3	34
NOV.	295	160	45.5	6.0	173	78	55.0	4.2	42
DEC.	235	150	36.0	4.8	230	127	44.0	5.8	53
TOTAL	-	-	-	73.7	-	-	-	11.5	723
AVG.	189	109	42.5	6.1	212	91	57.0	9.3	60

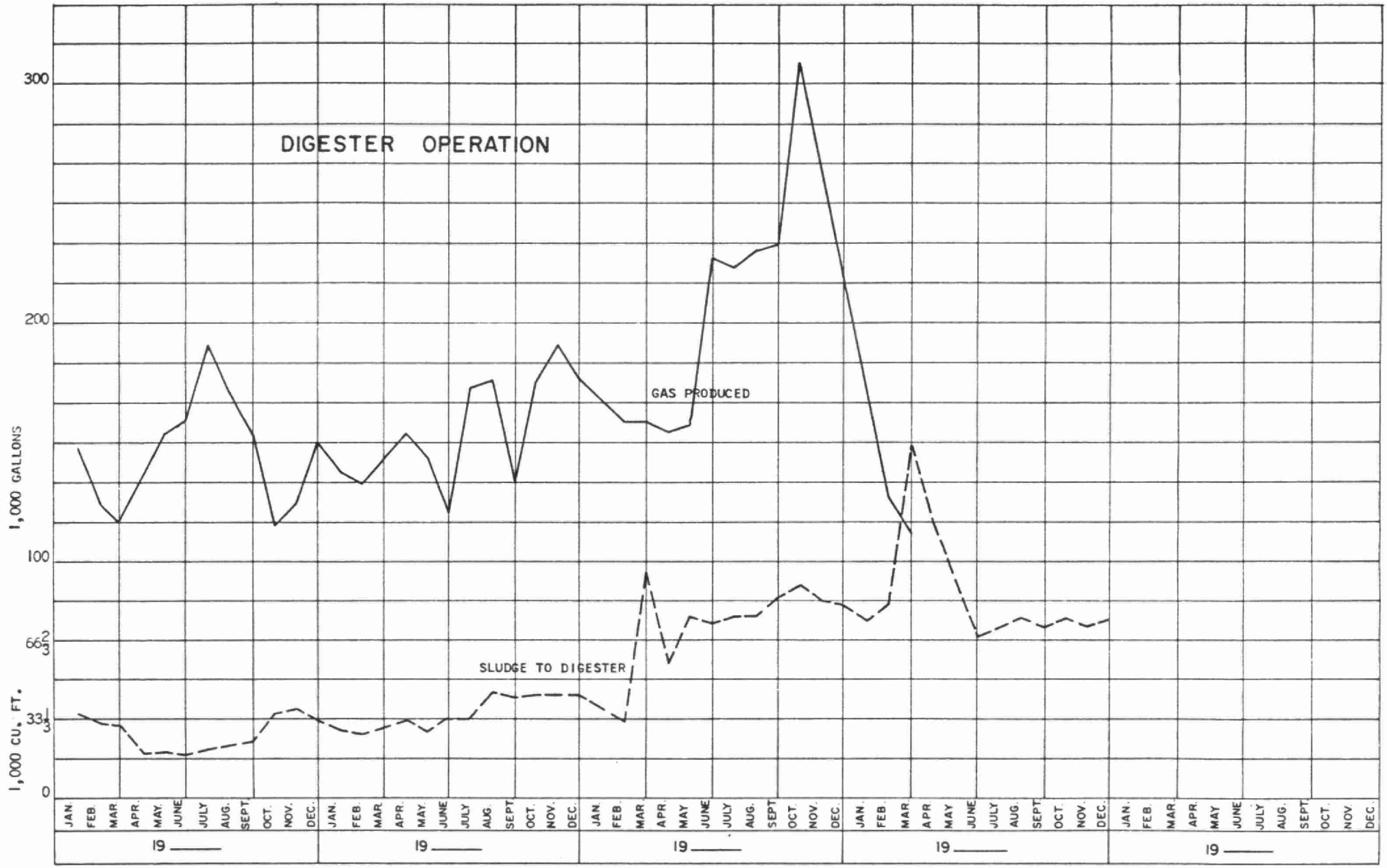
COMMENTS

The waste received at the Trenton plant during 1964 had an average 5 day BOD of 189 ppm. The average BOD strength of the plant effluent was 109 ppm resulting in a BOD removal efficiency of 42.5%.

This waste contained an average of 212 ppm suspended solids throughout the year. Suspended solids removal efficiency was 57 % producing an effluent that contained an average of 91 ppm suspended solids.

The average monthly grit removal throughout 1964 was 60 cubic feet.

The reduction outlined above are quite satisfactory for a primary treatment plant.


DIGESTER OPERATION
GAS PRODUCED
SLUDGE TO DIGESTER
1,000 GALLONS
1,000 CU. FT.
300
200
100
66 2/3
33 1/3
0
JAN. FEB. MAR. APR. MAY. JUNE JULY AUG. SEPT. OCT. NOV. DEC.
19 ____

DIGESTER OPERATION

MONTH	SLUDGE TO DIGESTERS			SLUDGE FROM DIGESTERS			GAS PRODUCED 1000'S Cu. Ft.
	1000'S CU.FT.	% SOLIDS	% VOL. MAT.	1000'S CU.FT.	% SOLIDS	% VOL. MAT	
JAN.	11.92	6.93	6.75	1.20	4.96	4.74	- *
FEB.	12.92	2.28	1.78	0.32	11.19	4.73	124.48
MAR.	24.00	3.07	2.35	6.49	8.30	3.96	111.39
APR.	18.77	3.85	2.84	-	10.60	5.26	-*
MAY	14.77 *	2.78	2.10	1.60	-	-	-
JUNE	10.31	2.25	1.28	3.12	4.40	0.15	-
JULY	11.62	5.27	3.92	0,16	8.65	4.60	-
AUG.	12.42	5.46	3.89	-	11.06	4.55	-
SEPT.	11.54	-	-	-	12.10	-	-
OCT.	11.92	2.34	1.50	-	13.62	5.36	-
NOV.	11.54	3.55	2.77	1.84	11.71	4.93	-
DEC.	11.92	2.34	1.70	-	11.18	4.86	-
TOTAL	163.65	-	-	14.73	-	-	-
AVG.	13.64	3.65	2.81	1.23	9.80	4.31	-

* meter out of service

COMMENTS

During 1964, 163,650 cubic feet or about 1,020,000 gallons of raw sludge was pumped to the digesters. This sludge had an average solids content of 3.65 percent equivalent to a total of 372,000 pounds of solids of which 287,000 pounds were volatile.

A digested sludge volume of 14,730 cubic feet or about 92,000 gallons was removed from the digesters. The average solids content of the digested sludge was 9.80%, equivalent to a total of 90,100 pounds of solids of which 38,900 pounds were volatile. Thus the amount of volatile matter destroyed was 248,100 pounds during 1964.

The average percent reduction in volatile matter in the digestion process was 76.5%. This is an indication of a very good anaerobic sludge digestion process.

The gas meter was out of order throughout most of 1964 and consequently, few figures are available on the gas production at the plant.

CHLORINATION

MONTH	PLANT FLOW (MG)	POUNDS CHLORINE	DOSAGE RATE (PPM)
JANUARY	23.10	-	-
FEBRUARY	16.94	-	-
MARCH	28.77	-	-
APRIL	25.58	-	-
MAY	18.99	562 *	6.14
JUNE	11.94	1157	9.69
JULY	7.13	1389	19.48
AUGUST	12.87	1428	11.10
SEPTEMBER	10.03	1452	14.48
OCTOBER	8.72	1521	17.44
NOVEMBER	8.85	1465	16.55
DECEMBER	11.33	1654	14.60
TOTAL	184.23	10628	-
AVERAGE	15.35	1328	13.28

* fifteen days chlorination

COMMENTS

During 1964, continuous year-round chlorination was required at the plant. Prior to this, chlorination of the primary effluent was practiced only during the summer months. A chlorine residual of 0.5 ppm after a 15 minute contact time is maintained in the primary effluent.

LABORATORY LIBRARY
96936000119729

CONCLUSIONS

At a total operating cost of $18,422.16, the Town of Trenton Water Pollution Control Plant removed 73.7 tons of BOD and 111.5 tons of suspended solids from the wastes of Trenton during 1964. The removal efficiency was quite good for a primary treatment process.

Frequent inspections by OWRC head office staff found the plant and pumping station maintained in a good condition by the plant personnel.




ONTARIO WATER RESOURCES COMMISSION